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Foundations of ophthalmology in Dutch East Indies: A look at distribution of early ophthalmology medical facilities (1900–1942)

Abstract. *This research examines the development of ophthalmology as a medical specialty in the Dutch East Indies between the years 1900 and 1942. The research is focus on the establishment of ophthalmology medical facilities, consist of ophthalmology hospitals, departments of ophthalmology, and ophthalmology outpatient clinics. The methods used in this research are a literature review of archival documents and spatio-temporal analysis. The primary source of archival documents for this study are the Medical Journal for the Dutch East Indies (Geneeskundig Tijdschrift voor Nederlandsch-Indie), Communications from the Civil Medical Service (Mededeelingen van den Burgerlijk Geneeskundige Dienst), Communications from the Public Health Service (Mededeelingen van den Dienst der Volksgezondheid), and Kolonial Verslaag. A spatio-temporal analysis was conducted to look at the distribution of medical facilities over time, using a phase division into three periods: 1900–1910, 1901–1930, and 1931–1942. This research indicates that the establishment of ophthalmology medical facilities was a response to the prevalence of eye health problems in the Dutch East Indies during the nineteenth century. During the period between 1900 and 1910, a notable advancement in ophthalmology occurred with the establishment od ophthalmology hospital. These facilities were predominantly concentrated in Java, particularly in cities that served as administrative centers, such as Bandung and Semarang. From 1911 to 1930, the number of medical facilities increased with the establishment of departments of ophthalmology in hospital and ophthalmology outpatient clinics.*

The construction of medical facilities commenced in Sumatra, particularly in Padang and Perbaoengan. In contrast, the medical facilities constructed during the period between 1931 and 1942 were exclusively outpatient clinics. The findings indicate that the early ophthalmology medical facilities were concentrated in Java and Sumatra. Additionally, this study delves into the diagnostic and therapeutic measures employed by ophthalmologists to address a spectrum of eye diseases. Based on these findings, it can be inferred that the establishment of ophthalmology medical facilities in the Dutch East Indies signified the acceptance of ophthalmology as a specialized field dedicated to advancing public health and encouraged further research into eye diseases and their treatment.

Keywords: *ophthalmology; eye care; medical history; hospital; outpatient clinic; Dutch East Indies*

Introduction.

Poor eye health was one of the health problems in the Dutch East Indies (now Indonesia). In 1891, Koningh reported that in 1890 eye disease was the fifth most common disease among ten categories, with 1417 cases. This was below the categories of other diseases (27359 cases), malaria (14129 cases), venereal diseases (9561 cases), and beriberi (4517 cases) (p. 204). Meanwhile, Steiner (1894) reported about his research in Surabaya and surroundings in 1894. Steiner highlighted the prevalence of blindness among the Javanese and the considerable damage caused by eye disease. Approximately 20% of the population suffering from eye diseases had lost their sight, mainly due to trachoma (Steiner, 1894). High cases of eye diseases are also found in other parts of Dutch East Indies, including Maluku and Aceh (Zondervan, 2016).

At the same time, medical facilities for people with eye diseases was not readily available in the region, which exacerbated the condition of those affected (Steiner, 1894). Although medical science has been introduced since the seventeenth century, with the establishment of the first hospital on July 1, 1626 (Schoute, 1937), it has not been able to reduce the high mortality rate. This is due to the inability of the medical services to treat various tropical diseases (including trachoma and other eye diseases) (Muhsin Z., 2012), as well as the limited medical services provided by the hospitals, which only offer preventive health services (Baha'uddin, 2005; Mumuh Muhsin, 2012) and are exclusively for the military (Baha'uddin, 2005; Zondervan, 2016),

That eye health is an essential need for humans to perform daily activities, therefore, eye care are important to overcome these problems. Ramke et al., (2022) defined eye care (or eye health services) as any type of intervention to improve eye health, which includes a spectrum of promotion, prevention, treatment, and rehabilitation. In medical terminology, the term eye care refers to the field of ophthalmology, a branch of medicine which involves the diagnosis and treatment of conditions affecting the eye and visual system (Lewis, 2020). Ophthalmology is a specialized field which encompasses a number of medical and surgical sub-specialties (Lewis, 2020).

Previous research by Marmion (2005) showed that the field of ophthalmology was accepted as a specialized field with the establishment of ophthalmology hospitals. Referring to this definition, ophthalmology in Dutch East Indies was only accepted as a specialized branch in the early 20th century with the establishment of the first eye outpatient clinic. Previous research in this area has not yet explored the early development of ophthalmology, although this research can help to illuminate contemporary issues. In a recent study, Dhakal (2023) posited that a comprehensive investigation of ophthalmology's historical development could offer invaluable insight into the fundamental principles of modern ophthalmology, ultimately leading to enhanced diagnostic and therapeutic approaches. In accordance with this argument, Coldefy and Curtis (2010) suggested that this type of research can assist in the formulation and evaluation of policies designed to enhance the provision of health services, with a particular focus on eye care. Consequently, research on the nascent field of ophthalmology in the Dutch East Indies is crucial for comprehending its evolution and the subsequent impact on the present state of eye care in Indonesia.

The historical studies of ophthalmology in Asia has been previously examined in Taiwan (Hou et al., 2016), India (Nair, 2012; Raman, R., & Raman, A., 2020; Sen et al., 2023), and China (Yusufu & Wang, 2018). Meanwhile in Dutch East Indies, although the historical studies of medical science and the colonial health system has been widely conducted, research on ophthalmology is still limited. Previous studies have explored the historiography of medicine and healthcare (Baha'uddin, 2005; Bergen et al., 2017; Hesselink, 2011; Indrawan & Isawati, 2022; Kurniawan & Agustia, 2021; Pols, 2018; Schoute, 1937); hospital system (Zondervan, 2016); medical education (Pols, 2024); medical research (Akbar & Handayani, 2022); and company healthcare (Ochsendorf, 2018). Specialized medicine, on the other hand, is still limited to psychiatry (Edington & Pols, 2016; Kloos, 2014; Pols, 2006, 2007, 2012; Pols & Wibisono, 2017), leprosy asylum (Snelders et al., 2019; van Bergen, 2018), the nursing profession (Gede Juanamasta et al., 2021; Hesselink, 2018), as well as maternal and child healthcare (Itawan, 2020).

This gap in research presents a significant challenge to fully comprehend the early development of ophthalmology as a specialized field and its evolution within the focus of early ophthalmology hospitals. This article aims to address this gap in knowledge by answering the following question: How did the distribution of early ophthalmology medical facilities in the Dutch East Indies evolve between 1900 and 1942? The research period selected is the early decades of the 20th century, a period of significant transformation in the health sector marked by the enactment of Ethical Politics and the first ophthalmology medical facilities was built during that time. Additionally, 1942 represents the conclusion of Dutch colonial rule. This research also highlights the early development of ophthalmology medical facilities as a transformation in eye care that was previously practiced traditionally and without the use of medical technology. By documenting the distribution, this research provides an interpretation of the areas of early influence in ophthalmology.

This research is related to the works of Zondervan (2016) and Doesschate (2017). Zondervan (2016) provides an overview of the history of hospital development in

Dutch East Indies, including ophthalmology medical facilities. However, the discussion lacks a detailed description of the hospitals and the types of eye care services provided. In contrast, Doesschate (2017) focuses on the treatment of trachoma, but it does not provide a comprehensive overview of ophthalmology medical facilities in Dutch East Indies.

Research Methods.

This research utilizes a literature review to reconstruct the distribution of ophthalmology medical facilities during the period 1900–1942. The first step of the research involved collecting archival documents, consisting of: Medical Journal for the Dutch East Indies (*Geneeskundig Tijdschrift voor Nederlandsch-Indie*), Communications from the Civil Medical Service (*Mededeelingen van den Burgerlijk Geneeskundige Dienst*), Communications from the Public Health Service (*Mededeelingen van den Dienst der Volksgezondheid*), *and Kolonial Verslaag*. The literature review phase was conducted by analyzing the reports to find information regarding the name of the hospital, year of establishment, type of treatment, and patient demographics. Three types of ophthalmology medical facilities were identified from the initial data collection, namely 1) ophthalmology hospitals (termed *gasthuis voor ooglijders* or *ophthalmologische kliniek* in archival documents), these facilities offer both inpatient and outpatient care; 2) hospital with departments of ophthalmology; and 3) ophthalmology outpatient clinics (termed *polikliniek voor ooglijders* in archival documents). The next step was to compile a database of hospitals and classify the types of medical facilities.

A spatio-temporal analysis was performed to examine aspects of hospital distribution. This analysis involved looking at both spatial (geographic) and temporal (time base) aspects to understand patterns and trends in the establishment of eye hospitals (Dong & Guo, 2021). The spatial data were processed using a QGIS application to create a spatial representation of ophthalmology medical facilities. By plotting the data on a map, this application helps to visualize the distribution of medical facilities over time. The temporal aspect is examined to analyze the distribution of medical facilities across different period. Zondervan (2016) has developed a historiographical framework of hospital care in the Dutch East Indies. It is divided into three periods: Period of Turmoil (1890–1910), Period of Expansion (1910–1930), and Period of Decentralization (1930–1942). We modified this periodization to account for the limited time frame of the study at the beginning of the 20th century, when ophthalmology medical facilities began to be established. In addition, we assessed that the boundaries presented by Zondervan are not clear; for example, the year 1910 cannot be defined as belonging to the period of turmoil or expansion. Therefore, in this study, the research phase is divided into:

1) Period 1900–1910: characterized by the beginning of the 20th century, where the ethical policy came into effect in 1901, which had an impact on the health sector, including the introduction of subsidies in 1906.

2) Period 1911–1930: Transition institutions for medical service from the Military Medical Service, to the Civil Medical Service, and subsequently to Public Health Service
3) Period 1931–1942: A period of stagnation due to the economic depression that led to the reduction of subsidies.

Thus, the spatio-temporal analysis will produce a visualization of the trend of medical facilities distribution based on the above phases. This analysis will lead to an interpretation of the areas that were first influenced by the field of ophthalmology and the direction of its spread by looking at where medical facilities were located.

Results.

The influence of Europe in Indonesia was significant in the evolution of the medical field between the seventeenth and twentieth centuries. In general, this can be observed in the establishment of medical facilities (hospitals, clinics, and outpatient clinics), institutions for medical service, educational and research institutions, and epidemic prevention institutions. This research is directly pertinent to the establishment of medical facilities and is also relevant to the work of institutions for medical service.

The earliest medical facility in the form of a hospital was constructed in Batavia on July 1, 1626 by Dutch East India Company (VOC) (Schoute, 1937). Until the early nineteenth century, VOC was responsible for the provision of medical care in the region, offering only limited services, particularly hospitals for military personnel and Europeans (Baha'uddin, 2005; Etten, 2017; Mumuh Muhsin, 2012; Zondervan, 2016). Following the dissolution of the VOC and the transition of authority in the region to the government of Dutch East Indies, a number of medical facilities has been established for the benefit of both military personnel and the civilian population (Etten, 2017). It must be acknowledged that the establishment of medical facilities in the Dutch East Indies was influenced not only by the Dutch East Indies government, but also by charity organizations, companies, and private philanthropy (Zondervan, 2016).

Conversely, the institutions for medical service also underwent modifications subsequent to the dissolution of the VOC. The government of Dutch East Indies undertook a reorganization of medical services, establishing the Medical Services (*Geneeskundige Dienst*), which were organized and provided by the state. The Medical Services were constituted of two distinct types, both under military supervision. The Military Medical Service (MMS) were provided for the military by army doctors, who were designated as health officers. The Civil Medical Service (CMS) were provided by civilian doctors for Europeans in three cities in Java (Jakarta, Semarang, and Surabaya) and by health officers in the colonies (Etten, 2017). In 1911, the CMS was separated from the MMS, becoming an independent institution. Subsequently, in 1925, the institution was renamed the Public Health Service (PHS) (Boomgaard, 1993).

The issues of eye care became a concern, mainly due to the high incidence of trachoma in the Dutch East Indies throughout the 19th century. Trachoma, as defined

by Giessen (1939), is a primary infectious disease of the conjunctiva with secondary spread to anatomical areas including the deeper tissues of the eyelids, cornea and lacrimal sac. It is characterized by the appearance of granules consisting mainly of inflammatory formation of lymph adenoid tissue and healing with scarring (Giessen, 1939). Trachoma is considered a leading cause of preventable blindness, with a significant impact on people who do not have access to clean water and proper sanitation (Mohammadpour et al., 2016).

The first case of trachoma was reported in the Medical Journal for the Dutch East Indies in 1863 (Doesschate, 2017). Steiner's report of his survey of the blind in Surabaya and the surrounding area found that 20% of the population suffered from eye disease, losing their sight mainly due to trachoma (Steiner, 1894). In addition to trachoma, other common eye diseases included blennorrhea conjunctivitis, xerophthalmia, keratomalacia, cataract and others.

On the other hand, the lack of special medical facilities for people with eye diseases in the 19th century exacerbated the impact of this case (Steiner, 1894). The report of Wijn (1905) in Ngawi also mentioned that trachoma patients in Ngawi were treated locally, but the treatment was long-term and patients often returned in the same condition as before.

Distribution of Ophthalmology Medical Facilities in 1900–1910.

The idea of establishing specialized medical facilities for ophthalmology originated in the early 20th century, although hospitals had been providing eye treatment as early as the 19th century. In the period between 1900 and 1910, five medical facilities were constructed in Java. These included four ophthalmology hospitals in Bandung, Ngawi, Semarang, and Kertosono, in addition to an ophthalmology outpatient clinic at the Modjowarno Missionary Hospital.

The establishment of the ophthalmology hospital in Bandung is inextricably linked to the contributions of Dr. C. H. A. Westhoff. He was a German ophthalmologist who studied ophthalmology in Utrecht and was trained by Gerrit Jan Mulder, Von Miquel, Donders, and Snellen. He returned to the Dutch East Indies in 1900 with broad experience as an ophthalmologist and a grasp of the fundamentals of education for the blind (Wilkens, 1913).

Westhoff initially established an eye clinic in Batavia, subsequently founding an Ophthalmology Outpatient Clinic in Bandung (*Oogheelkundige Polikliniek te Bandoeng*). The clinic was initially situated in the residence of Doyer, later relocating to the *Pradjoerits* barracks (Wilkens, 1913). In 1905, the outpatient clinic has provided treatment to 1,258 patients. This number has increased for three consecutive years (see Figure 1). The outpatient clinic provided services not only to patients from Bandung but also to those from other areas within the Preanger Residency (Geneeskundigen Dienst, 1910).

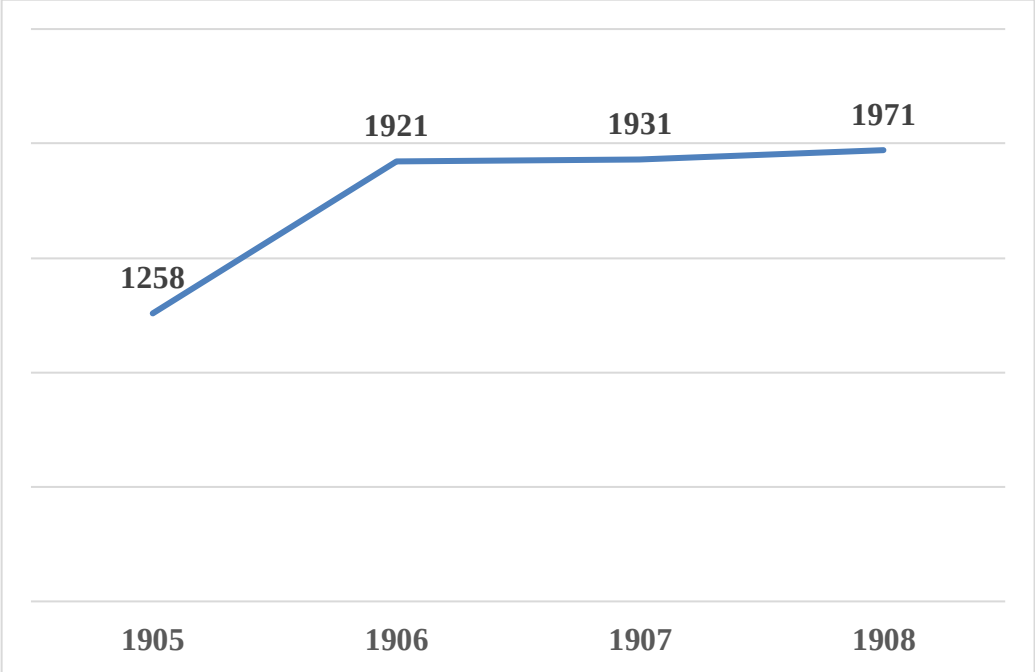

Figure 1. Number of Patients at Ophthalmology Outpatient Clinic in Bandung 1905–1908 (Geneeskundigen Dienst, 1906, 1907, 1908, 1910).

The establishment of the outpatient eye clinic was not Westhoff's sole contribution to the field of ophthalmology. In 1901, Westhoff established the Institute for the Blind (*Blindeninstituut*) in Bandung. This was followed by the establishment of Association for the Improvement of the Fate of the Blind in the Dutch East Indies (*Vereeniging tot verbetering van het lot der blinden in Nederland-Indie*) in 1906, of which Westhoff was the inaugural president (Wilkens, 1913). Additionally, Westhoff provided training for the indigenous ophthalmologists, known as "*doekoen mata*," but the training was discontinued in 1912 due to the lack of satisfactory outcomes (Wilkens, 1913).

In order to provide improved eye care, the Dutch East Indies government proceeded to construct an eye hospital. The hospital was inaugurated on January 3, 1909, by Governor General J. B. van Heutsz and designated as the Queen Wilhelmina Eye Hospital (see Figure 2) (*Koningen Wilhelmina Gathuis voor Ooglijders*). Westhoff was appointed as the inaugural director of the hospital (Westhoff, 1910). In 1909, a total of 2,536 patients were registered at the outpatient clinic, equating to an average of 77 eye patients treated per day. Of these, the most prevalent disease was trachoma, affecting 336 patients. Additionally, 496 eye patients were treated at the clinic, including 39 Europeans, 46 Chinese, and 411 indigenous people (Geneeskundigen Dienst, 1910).

Figure 2. The operating room with ophthalmologists and patients in the Queen Wilhelmina Eye Hospital in Bandung in 1920 (collectie.wereldmuseum.nl TM-ALB-0140-86).

In 1905, health officer P. Wijn published his report in the Medical Journal for the Dutch East Indies, expressing concern about the high prevalence of eye disease upon his arrival in Ngawi (Residentie Madiun) in August 1903 (p. 723). Wijn then initiated the establishment of the *Ophthalmologische Kliniek te Ngawi*. During the year 1904, a total of 1,432 indigenous patients were treated at the clinic, of whom 1,046 were suffering from eye diseases (p. 723). Wijn treated patients not only from Ngawi but also from outside the area. Some patients even stayed in there for one to three months for daily treatment. Furthermore, the provision of surgical assistance prompted individuals from surrounding communities to seek medical treatment (p. 723).

A report in the Medical Journal for the Dutch East Indies in 1906 indicated that during 1905, 1,679 patients were registered at the clinic, with the majority suffering from eye diseases, including 617 operations (Geneeskundigen Dienst, 1906). During the years 1906 and 1907, the number of patients treated was 1,080 and 824, respectively, with 832 and 518 surgical procedures performed, respectively (Geneeskundigen Dienst, 1907, 1908).

Meanwhile, an outpatient clinic has been opened in Modjowarno Missionary Hospital (Jombang District, Surabaya Residency, Oost Java) (see Figure 3). Van Twist (1907) reported that the number of patients receiving treatment for eye-related conditions reached 1,398 in 1906. However, due to the limited assistance available, comprehensive examinations were not feasible in many cases, particularly those involving the internal structures of the eye (van Twist, 1907).

The majority of patients presented with trachoma. The treatment was conducted with caustic agents, including the use of silver nitrate, zinc sulfate, and copper sulfate. In certain cases, the use of Knapp roller tweezers was deemed necessary. Of the cases that required surgical intervention, entropion and trichiasis were treated through the Snellen Operation, which was performed on 181 individuals. Additionally, 15 cataract

operations, four pterygium operations, two ectropium operations, and one staphyloma enucleation were conducted. All of these operations were successfully completed (van Twist, 1907). During 1908 and 1909, the number of patients with eye conditions was 1,260 and 1,281, respectively (van Twist, 1909, 1910).

Figure 3. Eye examination at the Ophthalmology Outpatient Clinic of Modjowarno Missionary Hospital (collectie.wereldmuseum.nl TM-10000795).

In the meantime, the inaugural eye hospital in the Semarang region of Central Java was established in 1907 by Dr. Vilhem A. Wille, a Danish ophthalmologist. The construction of the hospital was initiated by the Salvation Army in 1908 and was named Salvation Army Eye Clinic in Semarang (*Oogkliniek van het Leger des Heils te Semarang*) (Wille, 1914; Zondervan, 2016).

In 1914, Wille reported that the rate of cases in Semarang experienced a notable surge following the inauguration of the hospital (see Figure 4 and 5) (p. 8). The majority of cases involved major and serious surgical procedures, such as entropion (Wille, 1914). Meanwhile, trachoma treatment also received attention because it had an impact on other cases that required further treatment, such as keratitis ramificata. Trachoma treatment was divided into two categories: the first aimed to improve the condition, while the second sought to cure the disease. The former was more readily achieved through the use of *sulphascuricus, protargol*, *Cuysol*, and other disinfectant eye washes. However, this treatment was quite time-consuming. In contrast, the latter was a more difficult task that required specialized treatment, yet it facilitates a more rapid recuperation (Wille, 1914).

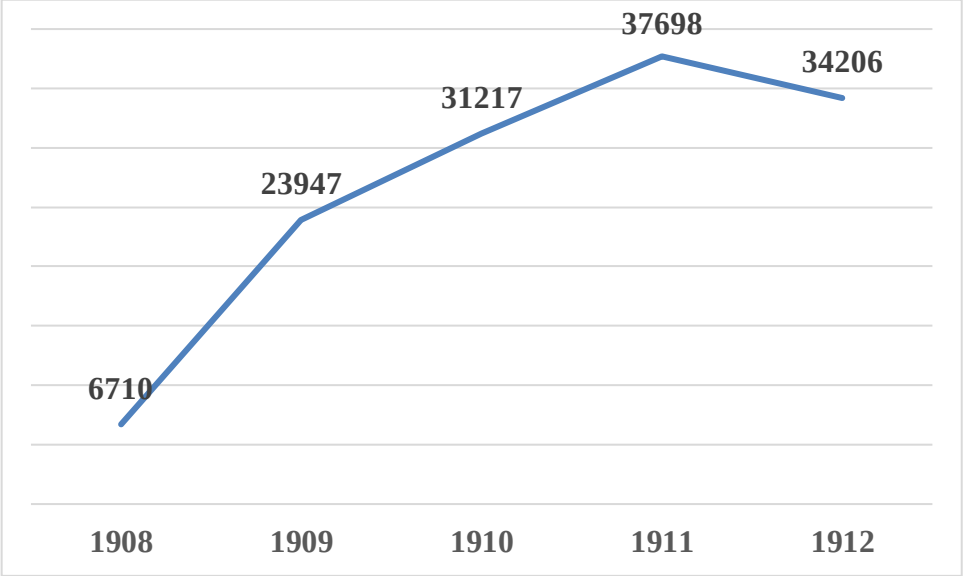

Figure 4. Number of consultations in Salvation Army Eye Clinic in Semarang 1908–1912 (Wille, 1914).

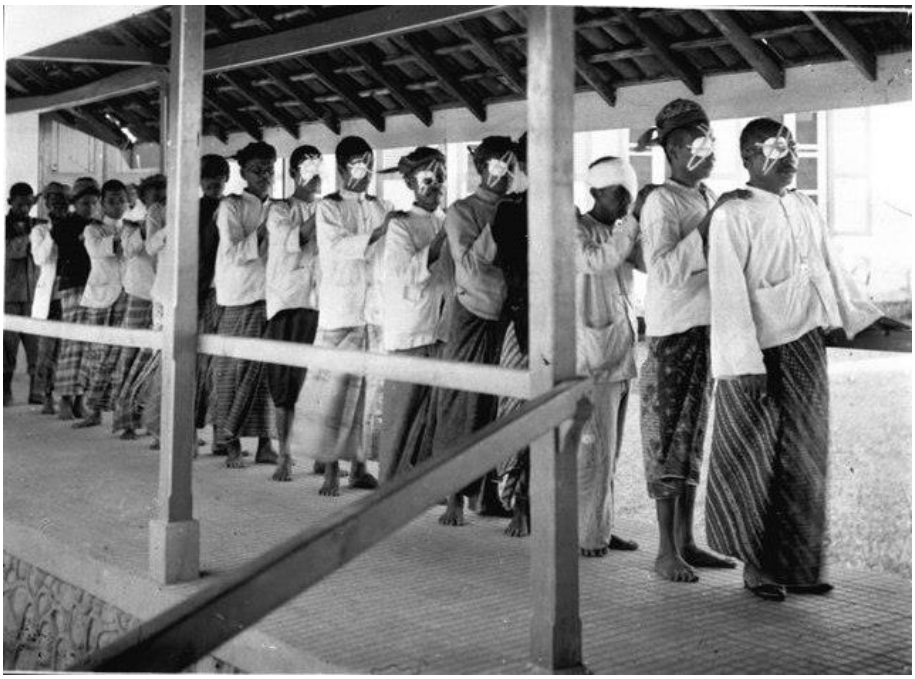

Figure 5. Patients from the Salvation Army's William Booth Eye Hospital in Semarang march to the clinic where they will be treated (collectie.wereldmuseum.nl TM-ALB-0039-92).

Towards the end of the initial decade of the 20th century, a hospital has been established in the village of Kertosono (Kediri Residency, Central Java) following the initiative of Liem Tik Koey. In the 1910 Koloniaal Verslag, it was noted that a hospital named "*Ziekenverpleging Liem Tik Koey*" and the basic articles of which had been approved by government on November 20, 1909. This hospital aimed to treating the sick and injured, especially those with eye problems, regardless of nationality (Koloniaal Verslag, 1910).

Distribution of Ophthalmology medical facilities in 1911–1930.

The number of medical facilities increased during the period of 1911 to 1930, with the opening of three ophthalmology hospitals, two departments of ophthalmology within hospitals, and four ophthalmology outpatient clinics.

The Surabaya Ophthalmology Clinic (*Soerabaische Oogheelkundige Kliniek*), a private hospital, was established on October 15, 1915, under the guidance of Dr. A. Deutman. The association has granted legal status by the government od Dutch East Indies on January 3, 1916. Its objective was to provide comprehensive eye care to individuals from diverse backgrounds (Dutch East Indies, 1918).

The 1919 CMS report indicated that eye health care has been established within the department of ophthalmology in the Central Civil Hospital (*Centrale Burgerlijke Ziekeninrichting*) in Salemba and the Military Hospital (*Militair Hospitaal*) in Surabaya. Furthermore, additional ophthalmology outpatient clinic has been opened at Red Cross Kemajoran, Tjikini Hospital, and Health Service (*Gezondheidsdienst*) in Surabaya (Burgerlijk Geneeskundige Dienst, 1922b).

The Department of Ophthalmology at the Central Civil Hospital constituted part of the STOVIA student practice area. It was initially established by the Military Hospital in collaboration with the military authorities. As the Central Civil Hospital in Salemba commenced operations, the clinic was subsequently relocated (Burgerlijk Geneeskundige Dienst, 1922b). In 1919, the ophthalmology clinic received 1,152 patients (Burgerlijk Geneeskundige Dienst, 1922b), and this number increased to 1,376 patients in 1920 (Burgerlijk Geneeskundige Dienst, 1922a). Furthermore, the Department of Ophthalmology at STOVIA was further developed by Dr. Bakker, who became a lecturer in the field of ophthalmology (Burgerlijk Geneeskundige Dienst, 1922a).

In a further development, an ophthalmology hospital has been established in the Djokjakarta Resident under the initiative of Dr. Yap Hong Tjoen. In his 1926 report, Dr. Yap outlined the various entities that provided support for the hospital's establishment. These included the *Vorstenlandsche Landbouwvereeniging* the Djokja department, which covered operational costs; the Djokjakarta Sultanate, which donated the location of the hospital free of charge; and the Dutch East Indies Government, which contributed significantly to the creation of the hospital (Tjoen, 1926).

Tjoen (1926) explained that the initial iteration of the ophthalmology hospital was an outpatient clinic that commenced operations on June 20, 1921, in a rented house in Gondolajoe. One year later, on November 21, 1922, the establishment of the hospital commenced with the laying of the first stone by Sultan Hamengku Buwono VIII, the Sultan of Djokjakarta (p. 144). Subsequently, on May 29, 1923, the hospital was formally inaugurated by the Governor General of the Dutch East Indies, Mr. D. Fock, and designated as the Princess Juliana Hospital for Eye Disease Patients (*Prinses Juliana Gasthuis voor Ooglijders*) (p. 144). The hospital initially had the capacity to accommodate only 16 patients and by the end of December 1925, the hospital had treated 72 inpatients (see figure 6 and 7) (p. 144).

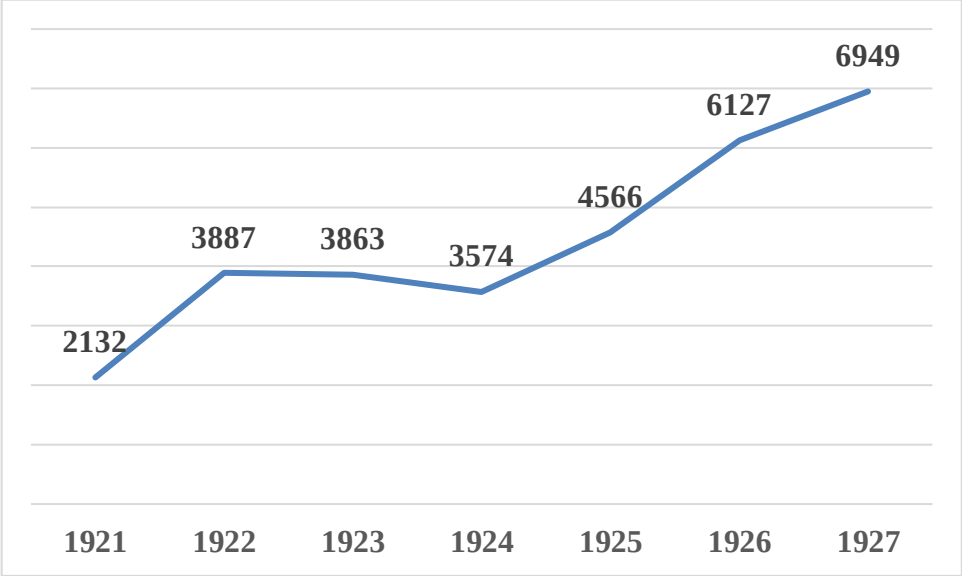

Figure 6. Number of Patients in the Outpatient Clinic and Princess Juliana Hospital for Eye Disease Patients 1921–1927 (Lian, 1928, p. 1075; Tjoen, 1926, p. 144).

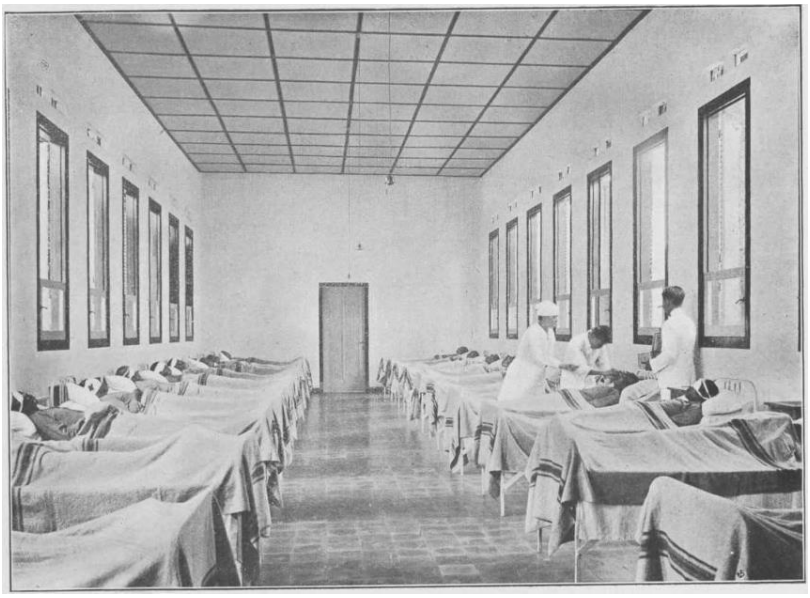

Figure 7. Treatment of patients in Princess Juliana Hospital for Eye Disease Patients (Tjoen, 1926, p. 144).

During the period between 1911 and 1930, the construction of ophthalmology hospitals commenced outside of Java. Peverelli (1930) published an article describing the Eye Patients Hospital Whitlau Foundation (*Ooglijders Hospitaal Whitlau-Stichting*) in Padang in Medical Journal for Dutch East Indies (p. 302). The hospital was established through a private initiative and funded by community contributions. Moreover, the local community pledged to provide annual financial support for the operational costs, while the government of Dutch East Indies was responsible for the remuneration of doctors and nurses. The hospital comprised both an outpatient facility and a ward with accommodation for 30 inpatients (Peverelli, 1930).

In addition to the ophthalmology hospital in Padang, outpatient clinics were established in Fort de Kock (Peverelli, 1930) and in Perbaoengan (Louwerier, 1923). In a report published in Medical Journal for the Dutch East Indies 1923, J. Louwerier outlined his efforts to construct an ophthalmology outpatient clinic in Perbaoengan. Since 1915, Louwerier had gained access to the Serdang Landscape Hospital (*Hospitaal van het Landschap Serdang*), where he treated patients from diverse of backgrounds. The most prevalent disease was trachoma, which necessitated prolonged treatment regimens and surgical intervention in numerous cases. Louwerier emphasized the necessity of constructing a specialized hospital for ophthalmological patients and work facilities for the visually-impaired people in the region, where they could develop the skills to become self-sufficient (Louwerier, 1923). It is regrettable that in the year 1920, Louwerier departed from the eastern coast of North Sumatra, after having lived in the region for an extended period of time (Burgerlijk Geneeskundige Dienst, 1921).

Distribution of ophthalmology medical facilities in 1931–1942.

During the period between 1931 and 1942, the growth and expansion of ophthalmology medical facilities was primarily limited to the establishment of outpatient clinics, with a geographical concentration on the islands of Java and Sumatra.

It is notable that during this period the concept of the ‘Travelling Ophthalmologist’ was first introduced. This was initiated by ophthalmologist Dr Tjissen, who practiced eye care by moving around (Zondervan, 2016). A report in the Medical Journal for Dutch East Indies, written by Winckel (1932), indicates that dr. Tjissen had resided in Langsar, Aceh since 1913–1929. In 1923, Tjissen conducted an examination of individuals with vision impairment from four villages situated along the northern coastline of Aceh. The findings revealed the presence of 226 individuals afflicted with eye disease, with 129 of them having lost their corneas or undergone scar tissue formation (Winckel, 1932).

In order to investigate the case further, Tjissen travelled to the area in late 1931, residing in Idi, on the east coast of Sumatra, for a period of two months. In this location, Tjissen collaborated with a male Javanese nurse in the hospital ward. Tjissen performed 45 cataract operations on 25 individuals, 23 of whom were able to regain sufficient vision (Winckel, 1932). Subsequently, Tjissen relocated to Loeng Poetoe, where he established an outpatient ophthalmology clinic in a small residence. The local government initiated a program to identify and collect individuals with blindness, which provided Tjissen with a source of patients for his cataract surgery practice. In a period of 25 days, Tjissen performed 105 cataract operations on 83 individuals, with the patients wearing occlusive dressings for a minimum of five days. A total of 55 patients with 71 operated eyes were examined; the results were classified as good in 58 cases, moderate in seven, and poor in six (Winckel, 1932). Following his time in Aceh, Tjissen relocated to Tapanoeli, Nort Sumatra, a region with a population of 90,000 lacking access to medical care. He proceeded to perform 247

eyelid operations on 148 patients diagnosed with trachoma and 17 operations on patients with cataracts (Winckel, 1932).

The work of Tjissen inspired the board of SIMAVI, a Christian organization dedicated to improving medical care for the native population in Dutch East Indies to dispatch ophthalmologist J. G. van Manen to Sumatra in 1937. Based on report by van Manen (1938), twofold: to serve as a traveling eye specialist and to evaluate Tjisssen's efforts for potential replication (van Manen, 1938). In his report, van Manen stated that he established an ophthalmology outpatient clinic in Taroetoeng, Tapanuli, North Sumatra (see figure 8). Over the course of a year, a total of 3,079 patients were registered, comprising 2,052 Batak, 514 Nias, 248 Malay, 125 Javanese, 79 Chinese, 26 Foreign Easterners, and 35 Europeans. The total number of operations performed was 663 in 394 different individuals on 549 eyes (van Manen, 1938).

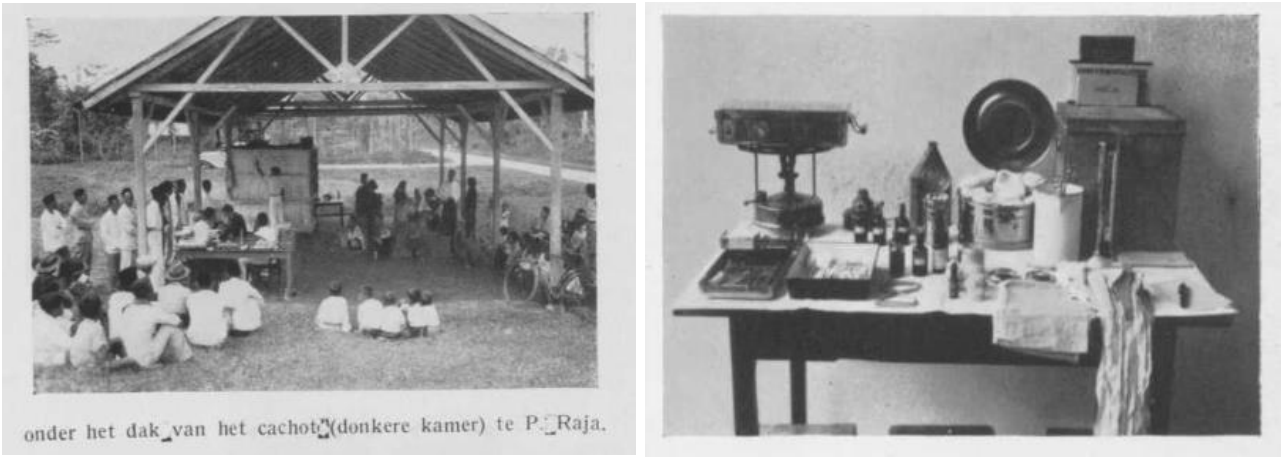

Figure 8. Ophthalmology Outpatient Clinic in Taroetoeng (left) dan operating table (right) (van Manen, 1938).

Van Manen worked in Sumatra for a year before returning to work in Java. He was then stationed in North Krawang to work with Dutch East Indies Association for the prevention and control of blindness (*Nederlandsche Indische Vereeniging tot voorkoming en bestrijding van blindheid*) and the West Java Mission to work toward alleviating the problem of blindness, particularly that caused by trachoma (van Manen, 1938). Van Manen also reported that this missionary doctor had an ophthalmology department in Krawang where he could treat patients with chronic trachoma, blennorrhea, and other eye diseases with which he had become more familiar during these preparatory months. Serious cases, for instance cataract operations, were sent to Dutch East Indies Association for the prevention and control of blindness in Batavia, (van Manen, 1938).

Remaining in the West Java region, the Medical Journal for Dutch East Indies in 1935 also mentioned that there were 7 ophthalmology outpatient clinics in Banten. In the second half of the year, 16,319 trachoma consultations were provided (Dienst der Volksgezondheid, 1936). An ophthalmology outpatient clinics has also been established in South-East Cheribon, where a 1938 report stated that several eye patients from Koeningan had been treated and well served (Dienst der Volksgezondheid, 1939).

A high number of trachoma cases were also found in Pemalang and Tegal (Pekalongan Residency, Central Java). Based on the PHS report of 1936, doctors were specifically assigned to eradicate trachoma in the region in 1935. The first doctor was stationed at the South and West Tegal Resort, which was assigned to outpatient clinics in Tegal, Ketanggoengan, Boelakamba, Klampok, Brebes, Kaligangsa, Adiwerna, Balamoas, Pangkah and Slawi (Dienst der Volksgezondheid, 1936). During 1935, the number of trachoma patients in this region reached 4,334 (Dienst der Volksgezondheid, 1936). A doctor was also stationed at the Pemalang and East Tegal resort, which managed outpatient clinics in Pemalang, Soegihwaros, Taman, Petaroekan, Tjomal, Soerodadi, and Kramat (Dienst der Volksgezondheid, 1936). During 1935, the number of trachoma patients in this area reached 4,334 (Dienst der Volksgezondheid, 1936). A report from 1938 indicated that 82 operations had been performed at the clinic in Pemalang (Dienst der Volksgezondheid, 1939). Eye health propaganda was also conducted by nurses, especially through home lectures (Dienst der Volksgezondheid, 1938).

Trachoma eradication was also carried out in North Surabaya. The PHS report of 1937 stated that trachoma outpatient clinic was routinely organized by nurses in Patjiran (Lamongan Residency). These nurses also routinely conducted consultations in other locations (Dienst der Volksgezondheid, 1938). A year later, the number of consultations at the Patjiran outpatient clinic decreased. In addition, there were also outpatient clinics in Brondong, Weroe, and Sentoel (Dienst der Volksgezondheid, 1939)

Discussion.

The early 20th century marked a significant period in the development of ophthalmology in the Dutch East Indies. The establishment of ophthalmology outpatient clinics in Bandung by Dr. Westhoff marked the beginning of a significant expansion in the provision of medical facilities dealing with eye care. During the period between 1900 and 1910, four ophthalmology hospitals and one ophthalmology outpatient clinic were established. All five medical facilities were located in Java, particularly in cities that served as administrative capitals for the colonial government (see Figure 9). Additionally, Westhoff undertook training initiatives to equip local medical professionals with the skills to become ophthalmologists, or "*doekoen mata*" but this program was ultimately discontinued due to its inability to meet the desired outcomes.

The transition of medical institutions in the Dutch East Indies from the MMS to the CMS and subsequently to the PHS had a significant impact on the proliferation of ophthalmology medical facilities during the period between 1911 and 1930. During this period, nine new medical facilities were established, comprising three hospitals (in Surabaya, Yogyakarta, and Padang), two departments of ophthalmology (Central Civil Hospital Salemba in Batavia and Military Hospital in Soerabaja), and four ophthalmology outpatient clinic (two in Batavia, Surabaya, and Sumatra). During this period, the distribution of hospitals began to extend beyond the island of Java, with

the establishment of medical facilities in Padang and Poerbangan (Sumatra) (see Figure 10).

Figure 9. Distribution of ophthalmology medical facilities in 1900–1910.

Figure 10. Distribution of ophthalmology medical facilities in 1911–1930.

The period between 1931 and 1942 was characterized by an economic recession in the Dutch East Indies, which resulted in a reduction of the allocated budget for healthcare (Baha'uddin, 2005; Zondervan, 2016). It seems reasonable to conclude that there was no new ophthalmology hospitals established during this period, which was likely a consequence of the prevailing economic recession. The establishment of ophthalmology medical facilities was directed towards the development of ophthalmology outpatient clinic in both Java and Sumatra, including in regions situated beyond the administrative capital the Dutch East Indies government (see Figure 11). A noteworthy development during this period was the advent of the 'Traveling Ophthalmologist', a program initiated by Dr. Tjissen and subsequently adopted by SIMAVI and van Manen. This initiative involved not only the provision of permanent treatment in a single location but also the deployment of ophthalmologists to other sites. This demonstrates a tendency to extend services to areas outside the city center, particularly in regions with a high prevalence of eye disease. Polyclinics are an optimal choice in these settings, as they require fewer resources to construct than hospitals, yet they can still deliver effective eye care and reach remote communities.

Figure 11. Distribution of ophthalmology medical facilities in 1931–1942.

This study reveals that the initial distribution of ophthalmology medical facilities was concentrated in Java, subsequently spreading to Sumatra. This finding demonstrates that the two regions were the initial recipients of medical influence in the field of ophthalmology. Conversely, this finding demonstrates the disparity

whereby ophthalmology medical facilities have yet to be established in other locations across the Dutch East Indies.

It is important to note that while no ophthalmology medical facilities were identified outside these two regions, treatment efforts were still being carried out. For example, in 1922 and 1923, F. Kopstein conducted research in Ambon and the island of Oeliassers. Kopstein determined that the most prevalent ocular disease was conjunctivitis, affecting 20% of school-aged children. Although this disease is harmless, it can lead to misdiagnosis due to its resemblance to trachoma. Additionally, trachoma was identified in 10% of the population (Kopstein, 1926). Further research was conducted by health officers Barto and A. Bobbert. In his report published in 1926, Bobbert offered a different perspective on conjunctivitis. He contended that the disease was, in fact, trachoma (Bakker, 1927). Subsequently, Bakker conducted further research and published his findings in the Medical Journal for the Dutch East Indies in 1927. The findings indicated that the majority of trachoma cases were likely conjunctival granulosis, a disease marked by the presence of large granules in children, with a proclivity for spontaneous resolution (Bakker, 1927). Furthermore, eye research was conducted in Makassar by Karamoy, who discovered a prevalence of trachoma in 15% of school-aged children (Bakker, 1927). A research also conducted in East Kalimantan revealed a prevalence of 2% for trachoma (Kuhlewein, 1930).

It can be concluded that the establishment of ophthalmology medical facilities in the early 20th century can be considered a catalyst that influenced the practice of eye medicine in present Indonesia. In the field of healthcare, medical facilities have been responsible for a significant cultural shift, whereby traditional forms of care are increasingly being replaced by medical treatment. The establishment of these medical facilities signified a new era for ophthalmology, marking the acceptance of this field as a specialized discipline. It is evident that the establishment of eye medical facilities has had a dual impact on the field of ophthalmology. On the one hand, it has facilitated the delivery of patient care. On the other hand, it has also encouraged the advancement of education and research in the field.

A number of the earliest hospitals constructed in the early 20th century are still in use today. The Queen Wilhelmina Eye Hospital is now the Cicendo Eye Hospital, the Salvation Army Eye Clinic in Semarang became the William Booth General Hospital, the Surabaya Ophthalmology Clinic is now the Undaan Eye Hospital, and the Princess Juliana Hospital for Eye Disease Patients is now the Dr. Yap Eye Hospital.

Conclusions.

This research has provided a historical overview of the development of ophthalmology in the Dutch East Indies in the early twentieth century with a focus on the distribution of medical facilities. The establishment of ophthalmology medical facilities was a response to eye health problems in the Dutch East Indies in the nineteenth century. This marked the advent of modern medical treatment methods, including the use of chemical drugs and surgical techniques such as eye surgery,

marking a transition from the traditional medical practices that had been employed in the Dutch East Indies.

During the first decade of the 20th century, the medical facilities built were hospitals and outpatient clinics. The distribution of these medical facilities was still concentrated on Java, especially the cities which were the centers of Dutch East Indies government. This characteristic shifted during the period 1911–1930, when an increasing number of medical facilities were built due to changes in health policy. The distribution also expanded with the opening of medical facilities outside Java, namely in Padang and North Sumatra. Meanwhile, the economic recession at the beginning of the period 1931–1942 affected the establishment of medical facilities. In this case, outpatient eye clinics were built. Until the end of 1942, the establishment of medical facilities was still concentrated in Java and Sumatra, while outside these two regions there were no ophthalmology medical facilities established and only research on eye diseases was carried out.

Moreover, this research also considers the role and contributions of ophthalmologists with regard to the provision of eye care services to patients. Their contributions to eye care efforts, including the training of eye doctors, the establishment of organizations for the blind, the concept of "traveling ophthalmologists," and lectures by nurses, have been instrumental in the eradication of eye disease in the region.

By documenting the history of ophthalmology and distribution of early medical facilities in the Dutch East Indies, this research provides a fundamental understanding of how ophthalmology has developed and influenced the way ophthalmology continues to practice in present Indonesia. This study focuses on the distribution of ophthalmology over time during the three periods that signaled the beginning of attention to eye health and the development of research and methods on the treatment of eye diseases. Therefore, further research is needed related to technological innovations used in the treatment of eye diseases.

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Conflict of interest.

The authors declare no conflict of interest.

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Основи офтальмології в Голландській Ост-Індії: Погляд на розподіл перших офтальмологічних медичних закладів (1900–1942)

Анотація. *Це дослідження аналізує розвиток офтальмології як медичної спеціальності в Голландській Ост-Індії в період з 1900 по 1942 роки. Дослідження зосереджується на утворенні офтальмологічних медичних закладів, зокрема офтальмологічних лікарень, відділів офтальмології та офтальмологічних амбулаторій. Методи, що використовуються у дослідженні, включають огляд літератури архівних документів та просторово-часовий аналіз. Основними архівними джерелами є «Медичний журнал Голландської Ост-Індії» (Geneeskundig Tijdschrift voor Nederlandsch-Indie), «Повідомлення цивільної медичної служби» (Mededeelingen van den Burgerlijk Geneeskundige Dienst),*

«Повідомлення служби громадського здоров'я» (Mededeelingen van den Dienst der Volksgezondheid) та Kolonial Verslaag. Просторово-часовий аналіз був проведений для оцінки розподілу медичних закладів у часі, поділивши їх на три періоди: 1900–1910, 1911–1930 та 1931–1942 роки. Це дослідження показує, що створення офтальмологічних медичних закладів стало відповіддю на поширені проблеми захворювань очей у Голландській Ост-Індії в дев'ятнадцятому столітті. У період між 1900 і 1910 роками відбувся значний розвиток офтальмології з відкриттям офтальмологічних лікарень. Ці заклади здебільшого були сконцентровані на Яві, особливо в адміністративних центрах, таких як Бандунг і Семаранг. З 1911 по 1930 роки кількість медичних закладів зросла завдяки створенню офтальмологічних відділень у лікарнях та офтальмологічних амбулаторій. Будівництво медичних закладів розпочалося також на Суматрі, особливо в містах Паданг і Пербаунган. На відміну від цього, медичні заклади, створені в період з 1931 по 1942 роки, були виключно амбулаторними клініками. Результати вказують на те, що ранні офтальмологічні медичні заклади були зосереджені на Яві та Суматрі. Окрім цього, у дослідженні розглядаються діагностичні та терапевтичні заходи, які офтальмологи використовували для лікування широкого спектра захворювань очей. Згідно з цими дослідженнями, можна зробити висновок, що створення офтальмологічних медичних закладів у Голландській Ост-Індії свідчило про визнання офтальмології як спеціалізованої галузі, присвяченої розвитку громадського здоров'я, а також стимулювало подальші дослідження захворювань очей та їх лікування.

Ключові слова: *офтальмологія; догляд за очима; історія медицини; лікарня; амбулаторія; Голландська Ост-Індія*

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